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Economic Aspects of Reproductive Problems in Utah and Southeastern Idaho Dairy Herds

Steve Lemrick
Utah State University

ECONOMIC ASPECTS OF REPRODUCTIVE PROBLEMS IN UTAH AND SOUTHEASTERN IDAHO DAIRY HERDS

by

Steve Lemrick

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Steve Lemrick

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ABSTRACT

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by

Steve Lemrick, Master of Science
Utah State University, 1987

Major Professor: Dr. Clive W. Arave
Department: Animal, Dairy, and Veterinary Sciences

One hundred eighty-seven survey questionnaires asking for reproductive information for 1985 were sent to dairymen in Utah and Southeastern Idaho. Forty-two herds with current DHI information and whose owners or managers completed and returned the questionnaire were used to estimate economic losses due to reproductive problems, especially excessive days open, in Utah and Southeastern Idaho.

Average days open for herds surveyed were 122.4 days with a standard deviation of 22.6 days, and a range of 89 to 177 days. Several factors were significantly correlated with days open including services per conception, previous calving interval, and missed heats. Missed heats accounted for most of the variability in days open with an r^2 of .82.

Surveyed dairymen were losing an average $1.22 per cow per day due to excessive days open beyond 90 days. In addition they were losing approximately $22.87 per cow per

year due to reproductive levels inferior to the top expected levels and veterinary costs associated with reproductive problems other than excessive days open. Although this is the estimated average loss in Utah and Southeastern Idaho, dairymen should try to determine losses in their own herds due to reproductive problems because of the extreme variability which exists among herds. Utah and Southeastern Idaho dairymen are suffering serious economic losses due to excessive days open and they need to improve their heat detection methods to reduce these losses.

(70 pages)

INTRODUCTION

Within the last three years, surveys dealing with integrated reproductive management (IRM) of dairy cattle have been completed in Utah and Southeastern Idaho (12, 13). The most significant finding of these surveys was that many dairymen, even those who are doing a good job of overall management, still need to improve reproductive performance of their herds. Especially needed is a reduction in calving intervals. Although reports from these surveys contain a large amount of information on reproductive management on an applied basis, they contain very little economic information. Marcinkowski (12) reported that of the dairymen he interviewed, many were knowledgable in terms of the economic losses which can be attributed to poor reproduction. However, several dairymen did not view these as identifiable losses. Rather, these losses were viewed as a lack of economic gains having less importance than a clear-cut identifiable loss. Marcinkowski further noted that dairymen need to be motivated to correct these losses. Documenting the cost of reproductive problems could supply a large portion of the motivation needed.

Several studies have been conducted which considered the economic losses resulting from poor reproduction in dairy cattle (5, 8, 10, 11, 14, 16, 17). Smith et al. (16) reported economic losses from long calving intervals result in less milk per day of productive life and fewer offspring available for sale and replacements. Culling due to reproductive failure increases purchase and(or) rearing costs of replacement heifers. Furthermore, low conception rates and low reproductive efficiency result in higher semen and veterinary costs. Smith et al. also noted that poor reproductive performance can result in problems in subsequent lactations and slower genetic gains which can lead to future economic losses. Although most researchers agree that excessive days open result in economic loss, there is widespread disagreement on the value of this loss. Studies have shown loss due to excessive days open to range from only a few cents per day to several dollars per day (5, 8, 10, 11, 14, 16, 17). Although several studies of reproductive efficiency have provided information for the United States, very little similar information is available for the Intermountain area. Weaver (18) reported information must be accumulated from a large number of herds under similar environmental and management conditions in order to determine what normal levels of reproductive performance are. Because of the sparcity of research in the Intermountain area concerning the economic aspects of poor reproduction and the results obtained from recent IRM surveys (12, 13) conducted in the area, this study was completed to: (1) show the economic losses due to reproductive problems in Utah and Southeastern Idaho dairy herds, (2) show the economic differences between herds with good and poor reproductive management, (3) determine the cost of excessive days open for dairy cattle in Utah and Southeastern Idaho, (4) develop guidelines which dairymen can use to help in deciding when individual cows with reproductive problems should be culled, and (5) determine economic effects of various management aspects of reproduction in order to recommend programs to improve reproductive performance. Cost estimates from this study will allow Utah and Suheastern Idaho dairymen to see the economic impact of poor reproducive performance in their herds which should be useful to them when making management decisions.

LITERATURE REVIEW

The Effects of Low Reproductive Efficiency on Profitability

Poor reproductive performance reduces profits due to its effects on several aspects of herd productivity. These include reduced milk production per day of life, fewer calves born, reduced genetic progress, increased cost of replacement heifers, higher semen costs, higher veterinary bills, and increased problems during subsequent lactations (5, 8, 16, 17).

Milking cows in late lactation is less profitable due to lower daily milk yields. Long calving intervals result in more milk per lactation, but less milk per day of life because cows spend more days in late lactation. Long calving intervals also result in fewer calves born each year, which results in fewer heifers for sale or herd replacements. This causes decreased profits from sales and increased costs for replacements (8, 16, 18). Reproductive problems can also slow genetic progress. As culling due to reproductive failure increases, culling based on poor milk production decreases and an increased number of replacements may be needed to maintain herd size. Reproductive problems also often encourage the use of bulls with low genetic merit because their semen costs less. Clean-up bulls of questionable genetic merit may also be used extensively. These practices slow genetic gains and may increase replacement costs resulting in reduced profitability in the long run (16).

Furthermore, low conception rates and low reproductive efficiency can increase semen and veterinary costs. When more units of semen are required to obtain each pregnancy, semen costs are increased unless less expensive semen is purchased. When reproductive efficiency decreases higher veterinary bills often result because more examinations and treatments are required to get cows settled.

Extended periods of low production and long dry periods can result in overconditioned cows. Smith et al. (16) reported that studies have shown overconditioned cows have an increased incidence of health and reproductive problems in subsequent lactations. All of the mentioned losses can result from poor reproduction in dairy cattle. As problems increase, income and profitability are reduced through effects on several areas of herd performance.

Economic Losses From Poor Reproduction

Many indicators are used to measure reproductive performance. However, according to Grusenmeyer et al. (8), average days open is the most important indicator of reproductive efficiency. Several studies have indicated economic losses result from excessive days open. But, there is wide disagreement concerning the amount of these losses (5, 8, 10, 11, 14, 16, 17). Smith et al. (16) reported a cost of $1.50 to $3.00 for each additional day open beyond 90 to 100 days. However, Holmann et al. (10) found that in the short run if cows were managed to maximize income over feed costs that costs associated with excessive days open up to 170 days are small or nil. Although, there is wide disagreement in the dairy industry on the economic value of excessive days open most studies agree that the cost is between one and three dollars for each day that the calving interval is extended beyond 12 to 13 months because of excessive days open (5, 8, 14, 16). The most quoted figure is $2.00 per day beyond 90 days open. However, this does vary between herds (8).

Several management factors contribute to total days open. The first factor is days in milk at first breeding. Britt (3) reported in a review that a study in which cows were assigned at first calving to be bred at first estrus after: (1) 40 days postpartum, (2) 60 days postpartum, (3) 100 days postpartum, or (4) 120 days postpartum for each subsequent calving interval in the herd showed the intervals between parturition and first insemination (days) and average calving interval (days) were 67 and 386; 80 and 421; 104 and 430; and 114 and 428, respectively. Britt noted that early postpartum breeding in dairy cows results in more calves and higher milk yield per day of herd life, but early bred cows required more inseminations per conception (3).

Conception rate is another factor contributing to days open. Grusenmeyer et al. (8) noted that services per conception is probably the best indicator of the conception rate of a herd. Providing everything is reported, the average services per conception should be below 2.0. They stated that herds using more than 2.0 average services per conception have a problem. High services per conception are costly. Estimates are that it costs an extra $1.50 per cow for each 0.1 service per conception over 1.5 (8).

Failure to detect estrus is the largest single factor contributing to excessive days open. According to Speicher and Meadows (17), improving estrous detection is the most effective way to improve reproductive efficiency. When Bozworth et al. (2) reviewed previous studies, they found that days lost per cow-year due to missed heats ranged from 9 to 38 days. They further found that only 10 percent of all anestrus results from disorders of the reproductive tract; while 90 percent results from failure to observe estrus, either from inadequate observation or variations in the intensity of estrus symptoms (2). Barr (1) noted that the correlation between days lost due to missed heats and days open was .92. Barr further found that Ohio dairymen on DHI were observing and using 1.7 heats per cow per year and missing 1.9 heats per cow. Approximately 53 percent of heats were missed. He concluded that failure to detect estrus appeared to have twice as much impact on total days open as did failure to conceive. Because the missed heat category contains days open due to embryonic loss and anestrus, it isn't expected that all anticipated heat periods will be observed. However, it does appear reasonable to reduce total days open due to failure to detect estrus to less than 21 days (1).

Anestrus and embryonic loss or abortion can also increase days open, especially if major disease or reproductive disorders are present. However, few herds contain major levels of disease or reproductive disorders, and dairymen are usually aware of their presence if they do exist. Although anestrus and embryonic loss or abortion do exist without major disease, they are not substantial factors contributing to excessive days open.

There is some disagreement on the optimum number of postpartum days open. Schaeffer and Henderson (15) stated that an open period between 60 and 90 days appears to be the ideal management practice in terms of efficiency. Grusenmeyer et al. (8) and Weaver (18) believe a reasonable goal for well managed herds is 90 to 110 days open. Grusenmeyer et al. added that commercial herds should average toward the lower end of this range while registered herds might justify the upper range.

They further stated any herd over 110 average days open should be investigated to determine where a reproductive problem exists (8).

Another indicator of reproductive status is calving interval. Calving interval as a reproductive management figure is a very adequate indicator of what has happened in the past, but does not indicate current reproductive status (8, 18). Days open and gestation length are the two aspects which affect calving interval; gestation length cannot be changed so dairymen can change calving interval only by altering days open (8). Specific calving interval recommendations vary; however, it should be kept within 12 to 13 months. Most studies show that a calving interval of 12.6 months or approximately 380 days produces maximum milk yields (5, 8). Grusenmeyer et al. (8) noted that the majority of cows in a herd need to have a 12 to 13 month calving interval to obtain top profitability. Furthermore, calving intervals of 13 months or slightly longer for first calf cows and 12 months or less for all other cows results in the largest economic gains (11).

An indicator of herd status which isn't directly related to reproduction, but is sometimes considered part of reproductive management is dry period length. Exceptionally long or short dry periods will adversely affect the profitability of individual cows (8). Grusenmeyer et al. (8) reported that several studies indicate that a dry period length of 45 to 55 days is ideal based on the milk yield of the following lactation. A short dry period does not provide adequate rest and time for mammary involution and regeneration. Long dry periods result in higher feed costs with no milk production and increase the potential for overconditioned cows. Estimated economic losses associated with improper dry period length are $3.00 per cow per day for each day over 60 days dry and $2.00 per day for each day under 40 days dry (8). Schaeffer and Henderson (15) reported slightly different findings, stating that dry periods of 50 to 59 days gave the highest average production in the subsequent lactation. However, they also stated that the average production for 40 to 49 days and 60 to 69 days dry was not greatly different on a practical basis. Dias and Alliare (4) found that the effect of dry period was greater for younger cows than for older cows. They concluded that cows with calving intervals greater than 365 days require fewer days dry than cows with short calving intervals. Cows producing relatively well, ie. equal to or greater than 19.0 kg daily 100 days before calving, require more days dry than cows producing less (4).

Evidence of Reproductive Problems
in Utah and Southeastern Idaho

Recent IRM studies (12, 13) have indicated Utah and Southeastern Idaho dairy herds are experiencing substantial reproductive problems. These problems include excessive days open, long calving intervals, poor services per conception, missed heats, and other reproductive problems. Norell and Lamb (13) noted that the best herds did many things right while the poor herds had problems in almost all aspects of herd management. However, they also noted that many dairymen who were doing a good job of overall management still need to improve herd reproduction as even they are having substantial losses due to excessive calving intervals (13).

The Southeastern Idaho IRM survey results indicated several areas of reproductive management which need improvement. The average days open for 84 herds was 120.0 days with a standard deviation of 25.4 days and a range of 60 to 209 days (13). This indicates significant problems because as Grusenmeyer et al. (8) reported, herds exceeding 110 days open should be investigated to determine the causes for excessive days open. He further reported that studies have shown a loss of approximately $2.00 per day per cow for every day over 90 days open (8). The average calving interval found by the Southeastern Idaho IRM survey was 13.1 months with a range of 11.7 to 16.1 months (13). Grusenmeyer et al. (8) reported problems exist if a herd calving interval exceeds 13 months. Falk (5) reported that Idaho DHI records show 50 percent of Idaho herds are exceeding a 13 month calving interval. The Southeastern Idaho IRM study also found that missed heats were a very significant problem as 50.4 percent of breedable heats go unnoticed in Southeastern Idaho. This is an average of 1.69 breedable heats missed per cow per year. Other areas needing improvement in reproductive management are services per conception and days to first breeding (13).

Marcinkowski (12) reported results similar to the Southeastern Idaho study in the Utah IRM study. The Utah results showed an average days open of 124.2 days with a standard deviation of 20.9 days and a range of 64 to 219 days. The average calving interval was 13.38 months with a range of 12.05 to 15.87 months. The Utah survey found that 40.6 percent of breedable heats were missed with a range of 8.3 to 75.0 percent. As in the Southeastern Idaho survey, the Utah survey found the existence of excessive services per conception and days to first service. The Utah IRM study also showed dairymen should improve the length of dry periods of their herds. The average dry period length was 63.3 days with a standard deviation of 9.6 days and a range of 31 to 85 days. The average does not reflect any real problems, but the range indicates there are some herds with dry periods which are too short and other herds with dry periods too long. Marcinkowski (12) reported that although the averages for many herds were good, there was tremendous variability between cows in individual herds with only 58.4 percent of cows having dry period lengths falling within eleven days of their option period.

The Utah and Southeastern Idaho IRM studies (12, 13) have indicated significant reproductive problems exist in Utah and Southeastern Idaho. Marcinkowski (12) concluded that many dairymen are aware of these reproductive problems, but don't see them as true identifiable economic losses; dairymen view such losses as a lack of income which doesn't warrant the same urgency as a true identifiable economic loss. Norell and Lamb (13) concluded that data from the well managed herds were more accurate than that from poorly managed herds due to better record keeping. Theoretically, the poorer the record keeping the more likely the dairymen were to underestimate the severity of problems in their herds. If indeed this is true then the reproductive problems in Utah and Southeastern Idaho could be even greater than those reported. Therefore, it is important to note that Utah and Southeastern Idaho dairymen as a whole need to improve reproductive management of their herds (12, 13).

MATERIALS AND METHODS

A questionnaire (Appendix A) was prepared to obtain information which would supplement information from DHI records. This questionnaire was mailed on February 28, 1986 to 187 dairymen in Utah and Southeastern Idaho. These dairymen had participated in previous IRM surveys and were believed to have current DHI records. They were asked to complete and return the questionnaire before March 20, 1986. Telephone contacts were made to dairymen not returning the questionnaire by the stated deadline. Dairymen who declined to participate in the survey when contacted were not recontacted. Some questionnaires were remailed to dairymen who hadn't received the first questionnaire or had lost it. After approximately two months of telephone follow-throughs the survey was discontinued.

Data were obtained from the questionnaire and either January 1986 or December 1985 Herd Summary Sheets from DHI records for each participating herd. These data were used for statistical analysis to determine economic losses due to reproductive problems in Intermountain dairy herds. A worksheet from Grusenmeyer et al. (Appendix B) was programmed into a HP 15C Programmable Calculator to determine the cost of excessive days open. Excessive reproductive costs associated with different numbers of days open were then compared to determine the actual cost per cow per day open beyond 90 days. Simple correlation coefficients between various management aspects and reproductive measures for all herds studied were used to determine which management aspects had the most influence on reproduction. If a significant correlation existed between a management aspect and a reproductive measure linear regression was used to determine the quantitative effect of the management aspect on reproduction.

A total of 42 herds with current DHI records were used in the study. However, due to missing data and some data which had to be omitted because of entry mistakes not all reported management and reproductive aspects were known for all 42 herds.

RESULTS AND DISCUSSION

Survey Response

One hundred eighty-seven questionnaires were originally sent to area dairymen. Initially, fifty percent participation was desired, but due to a lack of response to the study it was decided thirty-three percent participation would be adequate. After the questionnaire had been out for approximately three months which included two months of telephone contact it was decided to end the survey even though the 33 percent criterion had not been met.

Dairymen showed very little interest in the survey. Many thought the questionnaire was too long and complicated. Others thought some of the questions asked for information which they did not choose to provide because they dealt with financial information. Lastly, some felt it was too time consuming for them in relation to the benefit they would derive from it. The response of Utah and Southeastern Idaho Dairymen who were included in the survey is shown in Table 1.

Throughout the three months of the survey fifty-six dairymen responded to the questionnaire. Some dairymen never completed the questionnaire because they were out of the dairy business. Some of the returned questionnaires were not used either because dairymen had indicated their

DHI records couldn't be used or they were no longer testing with DHIA. DHI records were needed to help confirm the accuracy of the questionnaire and to obtain data which were not available from the questionnaire. One questionnaire was not used because the information was from a purebred Jersey herd. Due to a lack of Jersey herds in the study it would have been impossible to separate breed differences in the data with only one herd.

Data were used from 42 herds with current DHI records as Table 1 indicates. Some data were missing from the questionnaires because dairymen were asked to disregard questions on the survey for which they did not know the answers. Also some data had to be omitted because of entry mistakes by the dairymen; however, these were few in number. Data were also omitted from one DHI Herd Summary Sheet because it appeared that the dairyman had failed to record almost all rebreeding dates, which drastically distorted the data.

Table 1. Response of Utah and Southeastern Idaho dairymen who were included in the survey.

Variable	Number	Percentage
Questionnaires	187	100.00
Dairymen responding	56	29.9
Completed questionnaires returned	52	27.8
Questionnaires used in the study	42	22.5

Survey Results

The survey results for the 42 Utah and Southeastern Idaho herds studied showed the average herd size during 1985 was 98.9 cows. The average milk production per herd was 7870 kilograms (17,350 pounds) per lactation. Average reproductive measures were 83.0 days to first breeding, 1.75 services per conception, 13.3 months per calving interval, and 122.4 days open for surveyed herds. Average days dry were 63.4.

Norell and Lamb (13) reported the Southeastern Idaho IRM survey of 149 herds showed an average herd size of 94.2 cows with an average milk production of 19.8 kilograms (43.7 pounds) per day. The reported reproductive measures were 80.1 average days to first breeding, 1.63 average services per conception, 13.1 average months per calving interval, and 120.0 average days open for herds studied (13). Marcinkowski (12) reported that the Utah IRM study of 103 herds showed an average herd size of 119 cows with an average milk production of 7652 kilograms (16,870 pounds) per lactation. Average days to first breeding, services per conception, months per calving interval, and days open were 82.7, 1.75, 13.38, and 124.2 respectively (12). Table 2 illustrates the average, standard deviation, and range for herd size, milk production, and reproductive measures found by this study.

Table 2. Herd size, milk production, and reproduction of surveyed in Utah/SE Idaho dairy herds. Comparisons from Norell and Lamb (13), Marcinkowski (12), 1985 Utah DHI averages and 1985 Idaho DHI averages.

Variable	No. Herds	Mean	SD	Range	Norell and Lamb (13)	Marcin-kowski (12)	Utah DHI averages	Idaho DHI averages
No. cows in herd	42	98.9	68.3	27-365	94.2	119	105.2	93.1
Milk per lactation (kg) (pounds)	42	7870 (17350)	1366 (3011)	4815-10,805 (10615-23821)	6039* (13329)	7652 (16870)	7989 (17612)	7410 (16337)
Days to first breeding	38	83.0	13.3	52-112	80.1	82.7	84	79
Services per conception	38	1.76	.30	1.3-2.5	1.63	1.75	1.74	1.73
Services per cow	38	1.93	.51	1.3-3.1	--	1.96	1.95	1.92
Calving interval (mo.)	41	13.3	.97	11.5-16.7	13.1	13.38	13.41	13.17
Days open	38	122.4	22.6	89-177	120.0	124.2	125	122
Days dry	39	63.4	10.8	41-94	--	63.3	63	62

* Actual milk production was 19.8 kg. (43.7 lbs.) per day. This is equal to 6039 kg. for a 305 d lactation.

The values shown in Table 2 indicate Utah and Southeastern Idaho dairymen are suffering economic losses due to extra services per conception, excessive days open and calving intervals, and improper days dry. Although survey results were similar to previous IRM studies (12, 13) concerning aspects which were included in all three studies, milk production was higher for herds in this study than for those in previous IRM studies in Utah and Southeastern Idaho. Norell and Lamb (13) reported the average milk production for surveyed Southeastern Idaho herds was 19.8 kilograms per day (6,039 kg/305 d lactation). Marcinkowski (12) reported an average milk production of 7652 kilograms per lactation for surveyed Utah herds. The average milk production for those herds surveyed in this study was 7870 kilograms per lactation. The probable reason for these differences is Norell and Lamb studied both DHI tested herds and non-DHI tested herds. The present study was only of herds with current DHI records. Therefore, since DHI herds generally have higher average milk production than non-DHI herds and since milk production is increasing nationwide due to more efficient herd management and genetic improvement, milk production in this survey was much higher than that found by Norell and Lamb, and slightly higher than Marcinkowski's findings. Reproductive aspects which were included in all three studies were quite similar with variaions of only three days to first breeding, .13

service per conception, and .28 months for calving interval. This indicates that there were no apparent changes in reproductive measures for Utah and Southeastern Idaho within the last three years, since the herds in this study were also among the herds studied in the previous Utah and Southeastern Idaho IRM studies.

This study considered the economic consequences of reproductive problems whereas previous IRM studies did not. The questionnaire asked for economic information concerning feed, cattle, veterinary services, labor, and breeding of individual herds in Utah and Southeastern Idaho. The information obtained is summarized in Tables 3 through 7.

The cost of feed is generally the largest single operating expense paid by dairymen, unless they have large interest expenses. Dairymen were asked to report the price of a feedstuff only if it had been purchased. Because of this, only a few dairymen reported prices for some of the mostly homegrown feeds. However, the prices used in calculation should be fairly accurate since most are purchase prices. The reported prices of all feedstuffs except haylage and pasture were weighted by the amounts dairymen reportedly used to determine average prices. The prices for haylage and pasture were not weighted since few herds reported prices and most quoted prices were similar to the median price. Table 3 shows what surveyed dairymen in Utah and Southeastern Idaho paid for common feedstuffs in 1985.

The costs of feedstuffs shown in Table 3 should be accurate as a majority of surveyed dairymen reported both costs and amounts of feedstuffs used. However, percents of feedstuffs purchased may not be accurate as several dairymen did not report the percent of feedstuffs purchased. Therefore, they should be used only as estimates that indicate which feedstuffs dairymen mostly purchased and ones which they grew themselves.

Feedstuff prices times the amount of feedstuffs dairymen reportedly used yielded an estimate of the cost of feed used by surveyed dairymen to produce 100 pounds of milk sold in 1985. If dairymen didn't list the actual cost of feeds used on their dairy, the average prices listed in Table 3 were used. The feed costs of 100 kilograms of milk sold were calculated by multiplying the amount of feedstuffs used on each dairy by the cost, and then dividing the total feed costs by the total 100 kilograms of milk sold in 1985 by the dairy. For 28 herds sampled by the survey, the average cost for feed to produce 100 kilograms of milk sold in 1985 was $13.32 ($6.04/100 pounds) and ranged from $6.66 to $19.95 ($3.02-$9.05/100 pounds). Grusenmeyer et al. (8) reported Washington dairymen paid $13.89 to produce 100 kilograms ($6.30/100 pounds) of milk in 1981 and 1982. Considering economic changes since 1981 and 1982, the $13.32 finding of this study seems to be a reasonable estimate of what

Table 3. The cost and percent purchased of common feedstuffs which were used by surveyed dairymen in 1985.

Feedstuff	No. Herds	Average Price	Price Range	(%) Feedstuff Purchased
Concentrates ($/metric ton)	26	152	55-397	67
($/ton		(138)	(50-360)	
Hay ($/metric ton)	27	79	55-99	45
($/ton)		(72)	(50-90)	
Corn silage ($/metric ton)	12	23	17-28	33
($/ton)		(21)	(15-25)	
Haylage ($/metric ton)	3	28	22-36	25
($/ton)		(25)	(20-33)	
Cottonseed ($/metric ton)	19	185	165-219	100
($/ton)		(168)	(150-199)	
Pasture ($/metric ton)	7	33	6-77	51
($/ton)		(30)	(5-70)	

area dairymen are paying for feed to produce 100 kilograms of milk sold.

Another important expense to area dairymen is the cost of replacements as most dairymen are continuously buying or selling cows and heifers to maintain herd size. If dairymen do not buy replacements they must raise them. Newborn offspring also have an economic value to dairymen. Table 4 shows the value and cost of newborn calves, cull cows, replacement heifers, and breeding bulls to surveyed dairymen in 1985.

A wide range in cattle prices is indicated in Table 4. Some of the variability is caused by the price of registered cattle being included in the average for some categories. However, this variability was decreased when cattle prices reported by surveyed dairymen were weighted by the number of cattle valued at those reported prices to determine the mean value for each category. Averaging the cost of replacements purchased with replacements raised shows replacement heifers were costing surveyed dairymen around $800 per head in 1985. The value of pure-bred newborn offspring seemed to be drastically overestimated by some dairymen as indicated by Table 4. This was apparently the result of a misunderstanding by some dairymen of this question on the questionnaire. Some dairymen listed only a few registered offspring putting top prices on them rather than listing all newborn pure-bred and grade offspring separately along with their

Table 4. Average replacement heifer costs, cull cow prices, newborn calf values, and breeding bull costs in Utah and Southeastern Idaho which were reported by surveyed dairymen for 1985.

Variable	No. Herds	Mean	Range
		($)	($)
Cost of replacement heifers purchased	8	1004	675-2000
Cost of replacement heifers raised	24	784	500-1500
Price received for cows sold for dairy purposes	11	1006	500-2500
Price received for cows sold for beef	37	443	337-529
Value of grade newborn offspring	31	58	30-113
Value of pure-bred newborn offspring	22	229	68-850
Cost of breeding bulls purchased	7	1111	500-3500
Cost of breeding bulls raised	9	711	500-1000

average values. Another problem was very few dairymen actually sold registered newborn calves so many were guessing at their value. High priced registered cattle along with low numbers increased the average price received for cows sold for dairy purposes and the cost of purchased breeding bulls shown in Table 4 in relation to what one might expect for Utah and Southeastern Idaho. Although these are the actual values found by the survey for cull cows sold for dairy purpose and purchased breeding bulls, they may not be good estimates because of inadequate numbers.

Utah and Southeastern Idaho dairymen are also spending large amounts of money on veterinary services. Table 5 illustrates the cost of veterinary services to surveyed dairymen.

The data in Table 5 indicate that veterinary costs also show extreme variability among herds. Although there, no doubt, is a wide range in veterinary expenses among dairies, some of the variability in costs associated with reproductive problems may result from inaccurate estimates by dairymen who do not know actual costs. It is impossible to get precise information for single herds from questions of this type so more attention should be given to averages rather than individual herds when guessing may be involved.

The data in Table 5 show surveyed dairymen paid $8.93 per cow for veterinary services associated with

Table 5. Total veterinary expenses and veterinary costs associated with reproductive problems reported by surveyed dairymen for 1985.

Variable	No. Herds	Mean	SD	Range
Total vet costs/herd ($)	38	2653	2571	109-9800
Total vet costs/cow ($)	37	27.52	21.97	2.79-106.52
Vet costs associated with reproductive problems (%)	38	36.0	28.0	0-97
Vet costs per herd associated with reproductive problems ($)	36	1016	1600	0-6930
Vet costs per cow associated with reproductive problems ($)	36	8.93	9.66	0-39.86

reproductive problems in 1985. This is higher than Washington dairymen were paying in 1981 and 1982 (8). Grusenmeyer et al. (8) reported they were paying around $6.50 per cow per year. He also reported this was a very difficult value to obtain from a single herd.

Many surveyed dairymen indicated that they participated in herd health programs with their veterinarian. This study showed 23 dairies out of 42 surveyed were on a herd health program. This is similar to previous area IRM studies in which Marcinkowski (12) reported 64 out of 103 dairies surveyed in Utah and Norell and Lamb (13) reported 81 out of 145 dairies in Southeastern Idaho were on herd health programs. Furthermore, this study indicated there was no significant correlation between the use of herd health programs and total veterinary expenses. This indicates herd health programs do not increase the average dairyman's veterinary costs. However, Marcinkowski (12) reported that regular reproductive checks which are part of a herd health program do increase reproductive efficiency. Although this study did not show a significant correlation between veterinary costs and herd health programs those herds on the latter tended to have fewer days open.

The most variable expense to Utah and Southeastern Idaho dairies surveyed was labor costs. However, unlike other variables studied, labor cost estimates probably reflect the range which actually exists in the Utah and

Southeastern Idaho. Estimates of employee labor costs should be especially accurate. The amount and cost of labor to surveyed dairymen are shown in Table 6.

Most labor on surveyed Utah and Southeastern Idaho dairy farms consisted of family members. Several dairies, especially the smaller ones, employed only family members. Most dairymen do not pay family members nor themselves an actual wage for their labor. This reduces cash output for labor on dairies which employ mostly or all family members. But, unlike employee labor costs, unpaid family labor makes it difficult to assign an accurate value to total labor. The labor cost including family to produce 100 kilograms of milk is shown in Table 6. It was determined by multiplying total hours of labor on the dairy by the salary per hour the dairymen paid non-family employees and dividing by the total 100 kilograms of milk sold in 1985. Labor cost per 100 kilograms of milk sold including family is not extremely important, except that it indicates many dairymen and family members are filling the labor requirements of their dairies. It also indicates that many family members are not receiving a monetary return for their labor. Furthermore, some dairymen are trying to manage with a shortage of labor because they cannot afford higher labor costs. Although not significantly correlated, as labor per cow decreased average days open tended to increase. Dairymen who try to reduce labor costs with less labor per cow may be

Table 6. Hours of labor, workers per dairy farm, salary per employee, and labor costs to produce 100 kg. of milk in 1985 as reported by surveyed Utah/SE Idaho dairymen.

Variable	No. Herds	Mean	SD	Range
Total labor/herd/month (hrs)	32	726	470	200-2232
Non-family labor/month (hrs)	39	230	441	0-2232
Labor/cow/month (hrs)	32	8.82	5.44	2.7-24.5
Total workers/dairy (no.)	37	4.1	2.78	1.0-14.5
Family workers/dairy (no.)	40	2.8	1.9	0-8
Salary/full-time employees ($/mo.)	15	897	268	600-1500
Salary/hour excluding family ($)	23	4.87	1.81	2.00-9.38
Labor costs excluding family				
($/100 kg. milk)	30	1.37	1.59	0-6.92
($/100 lbs. milk)		(.62)	(.72)	(0-3.14)
Labor costs including family				
($/100 kg. milk)	23	6.00	4.03	2.14-19.69
($/100 lbs. milk)		(2.72)	(1.83)	(.97-8.39)

increasing their losses due to reproductive problems.

The last major costs which are associated with reproduction are breeding expenses. Forty-eight percent of the dairymen surveyed reported they used only artificial insemination for breeding milking cows. Eight percent used only natural service, and 44 percent used both. Comparable percentages for heifers were respectively, 33.5, 23.5, and 45 percent. Table 7 shows breeding information and costs for dairymen surveyed in Utah and Southeastern Idaho.

Table 7 shows the cost of artificial insemination to surveyed dairymen. Although most cattle in the Utah and Southeastern Idaho survey were bred artificially, several were not. Marcinkowski (12) reported in a previous Utah IRM study that many dairymen were using natural service for clean-up purposes. However, several used natural service rather than artificial insemination because they veiw it as an easier and more efficient way of getting cattle, especially replacement heifers, settled (12). Dairymen using natural service may suffer future economic losses from reduced genetic merit. Hillers et al. (9) reported an economic advantage for dairymen using genetically superior AI sires rather than herd bulls, except in herds with poor estrous detection and heifer rearing.

Surveyed dairymen were also suffering economic losses due to delayed first breeding of heifers as Table 7

Table 7. Cows and heifers giving birth to A.I. sired calves, age and weight at first breeding of replacement heifers, and cost of artificial insemination for 1985 as reported by surveyed dairymen.

Variable	No. Herds	Mean	SD	Range
Cows giving birth to AI sired calves (%)	38	75.7	31.7	0-100
Heifers giving birth to AI sired calves (%)	39	54.7	42.1	0-100
Age at first breeding of grade heifers (mo)	32	17.2	2.2	14-24
Age at first breeding of registered heifers (mo)	23	16.8	2.0	14-21
Weight at first breeding of grade heifers (kg)	24	383	38	318-454
(lbs)		(844)	(83)	(700-1000)
Weight at first breeding of registered heifers (kg)	14	379	38	340-442
(lbs)		(836)	(84)	(750-975)
Total AI breeding costs/herd ($)	35	2115	2518	0-12,600
Units of semen used/herd (no)	35	153	157	0-820
Cost/unit semen in 1985 ($)	32	13.15	4.93	6-30

illustrates. Most Utah and Southeastern Idaho dairymen surveyed waited until replacement heifers were approximately 17 months of age to first breed them. These heifers were not entering the milking herd until they reached an average age of 28.7 months (with a range of 22 to 39 months). Gill and Allaire (6, 7) found that additional milk per day of life associated with increasing age at first calving was not sufficient to overcome the higher depreciation costs of decreasing herdlife. They reported profit per day of life to be the greatest when heifers calved at about 25 months of age.

Economic Losses Due to Excessive Days Open

Excessive days open may be attributed to five basic factors which are: excessive days in milk at first service, failure to conceive, missed heats, anestrus, and embryonic loss or abortion. Most surveyed dairymen preferred to start breeding cows around 60 days in milk. Although this study found a significant correlation between actual days in milk at first breeding and average days open, there was no significant correlation between the surveyed dairymen's option for days in milk at first service and average days open. This was due to a lack of variation between herds because almost all dairymen surveyed had an option period at or near 60 days in milk. Furthermore, this indicates that many of those dairymen surveyed are not breeding cows for the first time at or near their option. Table 8 shows the correlations of several herd composition, production, veterinary, labor, and reproductive variables with days open.

The data in Table 8 show most variables which were measured were not significantly correlated with days open. Low correlations between several variables and days open were evident. Although they were not statistically significant, the correlations between some variables and days open did indicate trends. From these trends, the following generalizations were made: (1) production variables probably do not greatly influence days open, (2) herd health programs may decrease days open to some extent, (3) insufficient labor can increase days open, and (4) an increase in times milked per day may increase days open.

Production variables probably do not have any great influence on days open. Correlations between production variables studied and days open were almost zero. Although not statistically significant, these correlations suggest production factors have no real influence on days open.

These data indicate that the use of a herd health program may reduce days open. Marcinkowski (12) reported that a series of veterinary palpations performed on all open cows can significantly reduce days open. Norell and Lamb (13) found that a herd health program along with good

Table 8. Correlations of several herd composition, production, veterinary, labor, and reproductive variables with days open.

Variable	No. Herds	Correlation
Herd size	38	-.078
Average age of cows in herd	38	.013
Registered cows in herd (%)	38	.127
Times milked/day	38	.199
Milk/lactation (Kg)	38	.022
Milk fat/lactation (Kg)	38	.035
Use of herd health program	38	-.128
Total vet costs/cows in herd	33	-.018
Labor/cow in herd/month (hrs)	28	-.135
Total workers on dairy farm	33	-.230
Number cows in herd/worker	33	.051
Previous calving interval	38	.660**
Option for days open	38	.159
Days in milk at first breeding	38	.687**
Days lost due to missed heats (missed heats)	38	.904**
Days lost due to failure to conceive (services per conception)	38	.354*

*(P $<$.05) **(P $<$.01)

heat detection significantly reduced days open; however, herd health programs were not that beneficial in herds with poor heat detection.

Herds in which dairymen try to operate without sufficient labor may have increased days open. Although not statistically significant, the correlation of two labor variables with days open indicated days open may increase as labor decreases. Hours of labor per cow in herd per month and total workers per dairy farm were negatively correlated with days open. There was no correlation between the number of cows in herd per worker and days open. Excessive days open may be caused by poor estrous detection due to insufficient labor.

No herd composition variables studied were significantly correlated with days open. A few dairymen reported they intentionally delayed the breeding of some registered cows in order to lengthen their lactation to increase their total milk production per lactation. This may increase days open in some registered herds. However, percent registered cows in herd and days open were not significantly correlated in this study. There was a positive correlation between times milked per day and days open, but it too was not significant. Only seven of the 38 herds studied were milked three times per day, so this may not be a good measure.

Unlike all other variables studied, several reproductive variables were significantly correlated with days open. Although several reproductive variables shown in Table 8 were significantly correlated with days open, only missed heats and services per conception directly influenced days open. Days in milk at first breeding influence days open, but days in milk at first breeding are also influenced by missed heats. Option for days open can influence days open, but as previously mentioned most dairymen surveyed had an option period around 60 days in milk. Due to a lack of variation no significant correlation was found between option to first service and days open. Previous calving interval has no direct effect on days open because the previous calving interval is a measure of days open and gestation length of the last calving interval, while days open is a measure from the last parturition until the cow is bred again. The significant correlation between previous calving interval and days open indicates that dairymen with excessive days open generally had problems with excessve days open in the past, also.

Formulas reported by Barr (Appendix C) were used to derive days lost due to missed heats and extra services per conception. Days lost due to conception failure equal services per conception minus one (one service is required to get cattle settled) times 21 days (one estrous cycle). Days lost due to missed heats equal total days open minus voluntary waiting period minus 10.5 days (one-half estrous cycle) minus days lost due to conception failure.

Based on the r^2 of the correlations in Table 8, missed heats accounted for approximately 82 percent of the variability in days open, while services per conception accounted for about 13 percent of the variability. Barr (1) reported that in ten Ohio herds studied, missed heats and services per conception accounted for 85 and 14 percent of the variability in days open, respectively. Together missed heats and failure to conceive directly account for most of the variability in days open. Anestrus and embryonic loss or abortion can account for some increase in days open; however, these are usually minimal. Bozworth et al. (2) reported in a review that only ten percent of reported anestrus results from disorders of the reproductive tract; the remaining ninty percent is due to failure to observe estrus either from inadequate observation or lack of intensity of estrus symptoms.

Because of the variability among herds and inaccuracies discovered from reports of surveyed dairymen, no attempt was made to show actual economic losses in herds of different reproductive levels, rather only averages were used to estimate these losses. Grusenmeyer et al. (8) reported that costs associated with excessive days open include lost milk production, added veterinary costs, extra AI costs, added replacement costs, and decreased numbers of offspring. Furthermore, Grusenmeyer et al. devised a worksheet (Appendix B) which they reported dairymen can use to determine the cost of excessive days open in their herds. Although this worksheet has some major problems, it was used to estimate the cost of excessive days open to dairymen included in this study. Table 9 and Figure 1 show the estimated cost of days open exceeding 90 days. Figure 2 shows how these estimates were derived using the worksheet from Grusenmeyer et al.

As Table 9 (column 2) and Figure 1 indicate the cost per cow per day decreases as days open increase when using the worksheet from Grusenmeyer et al. (Appendix B). This is due to two major problems in the design of the worksheet. The worksheet determines all economic losses due to reproductive levels inferior to the highest levels of reproduction which can be expected on an average basis (8). The worksheet then divides total economic losses due to inferior reproduction by days open exceeding 90 days to derive the cost per day of excessive days open. The first problem is that not all of the economic losses derived using the worksheet can be attributed to excessive days open as the worksheet does. Most surveyed dairymen had reproductive culling levels and services per cow exceeding those Grusenmeyer et al. (8) based their worksheet on, regardless of days open. Furthermore, this study found no significant correlation between days open and reproductive culling rates (r=.03) nor between days open and reproductive veterinary costs (r=.09). Although not

Table 9. Cost per day per cow and total cost per cow due to excessive days open beyond 90 days as derived using the worksheet form Grusenmeyer et al. (Appendix B) and survey information form Utah/Southeastern Idaho dairymen.

Days open	Cost/cow/day ($)	Total cost/cow in herd ($)
95	5.80	28.98
100	3.50	35.03
105	2.75	41.21
110	2.36	47.26
115	2.14	53.44
120	1.98	59.49
122.4*	1.93**	62.46**
125	1.88	65.67
130	1.79	71.72
135	1.73	77.90
140	1.68	83.95
145	1.64	90.13
150	1.61	96.31
155	1.57	102.36
160	1.55	108.54
165	1.53	114.59
170	1.51	120.77
175	1.49	126.82
180	1.48	133.00

*Average days open for surveyed herds

**Figure 2 shows how estimates were derived

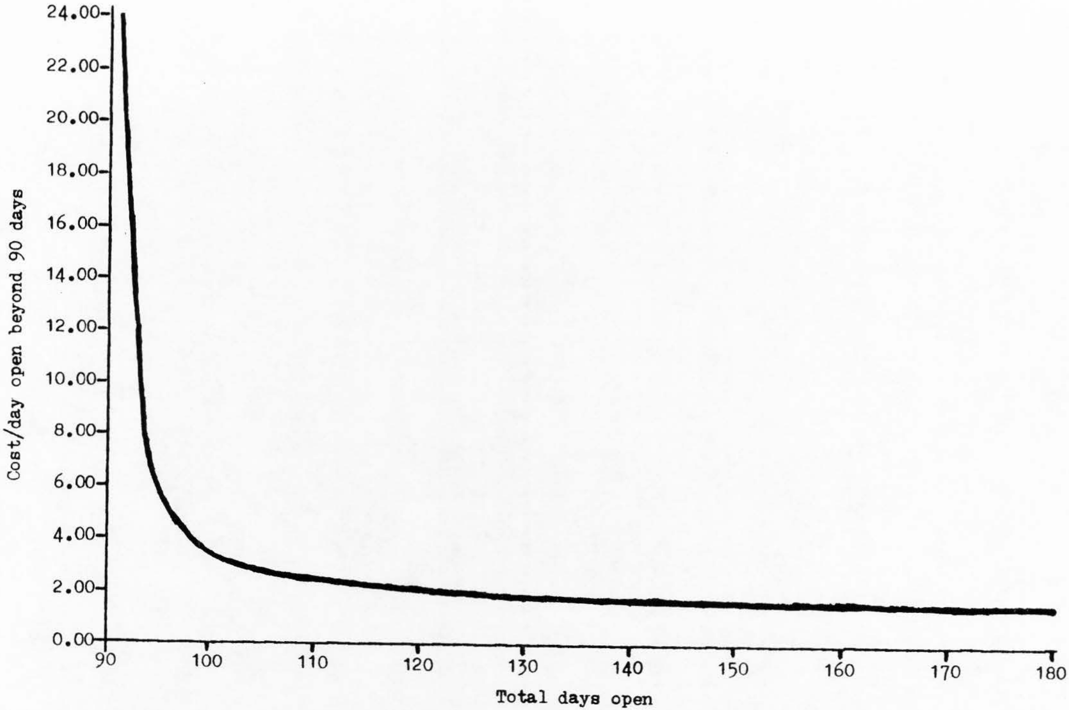

Figure 1. Cost per day per cow due to excessive days open beyond 90 days as derived using the worksheet from Grusenmeyer et al. (Appendix B) and survey information from Utah and Southeastern Idaho dairymen.

DHI Values		Your Estimates	
Average days open	122.4	Replacement cost	$ 806
122.4 Days open − 90 = 32.4 excessive days open			
Blend milk price	$11.80	Cull slaughter value	$ 443
Number of reproductive culls	11	Av. A.I. service cost	$ 13.15
Total cows in herd	98.9	Vet and medicine per cow	$ 8.93
Service per cow	1.93	Av. value of calves born	$ 58

PRODUCTION

(.1744 x 122.4 days open) − 17.6606 = 3.69 cwt's of milk lost

$ 11.80 blend milk price − $ 6.04 feed cost per cwt of milk = $ 5.76 value of potential milk

3.69 cwt's of milk x $ 21.25 loss/cow/year

$ 21.25 loss/cow/year ÷ 32.4 excessive days open = $ 0.66 loss/cow/day

ADDED A.I.

1.93* services per cow − 1.5 = 0.43 extra services/cow

0.43 extra services/cow x $ 13.15 service cost = $ 5.65 extra cost/cow/year

5.65 extra cost/cow/year ÷ 32.4 excessive days open = $ 0.17 loss/cow/day

VET AND MEDICINE

$ XX total dollars spent on problem cows ÷ XX cows in herd = $ 8.93 annual/loss/cow

$ 8.93 annual loss per cow ÷ 32.4 excessive days open = $ 0.28 loss/cow/day

CALF LOSS

$ 58 av. calf value ÷ 380 = $ 0.15 calf loss/cow/day

REPLACEMENTS

11 No. reprod. culls ÷ 98.9 total cows = 0.11 = 11 % reprod. culls

11 % reprod. culls − 5% = 6 % excess reproductive culls

6 % excess reprod. culls = 0.06 x 98.9 cows in herd = 5.93 excess reprod. culls

$ 806 replacement cost − $ 443 cull value = $ 363 replacement-cull difference

5.93 number excess culls x 363 replacement-cull difference = $ 2153 herd loss

$ 2153 herd loss ÷ 98.9 cows in herd = $ 21.77 loss/cow/year

$ 21.77 loss/cow/year ÷ 32.4 excessive days open = 0.67 loss/cow/day

TOTAL COST OF DAYS OPEN

	per day	per year
Value of lost production per cow	$ 0.66	$ 21.25
A.I. costs per cow	$ 0.17	$ 5.65
Vet and medicine cost per cow	$ 0.28	$ 8.93
Calf loss per cow	$ 0.15	$ 4.86
Replacement cost per cow	$ 0.67	$ 21.77
Total cost per cow beyond 90 days open	$ 1.93	$ 62.46

* Services per cow equal 1.93 plus or minus 0.005 for each day open greater than or less than 122.4 days.

Adapted from Grusenmeyer et al. (8)

Figure 2. Example of how the cost estimates in Table 9 were derived for 122.4 days open using the worksheet from Grusenmeyer et al. (Appendix B) and averages for surveyed herds.

significant, the correlation between services per cow and days open (r=.22) indicated services per cow increase as days open increase. The slope (a=.0051) and y-intercept (b=1.304) indicated only a .005 service per cow increase per day as days open increased. Grusenmeyer et al. based their worksheet on the best levels of reproduction which can be expected on an average basis which were five percent culling due to reproduction and 1.5 services per conception. Surveyed dairymen had an average culling rate of approximately 11 percent and averaged 1.9 services per cow in 1985. Due to two facts, (1) that the average reproductive levels of surveyed Utah and Southeastern Idaho herds exceed the levels Grusenmeyer et al. based their worksheet on and (2) many of the costs listed on the worksheet were not significantly correlated with days open; it was concluded from this study that, although the losses in Table 9 result from reprodctive problems, many are not totally due to excessive days open.

The second problem is a mathematical one relating to the first. Using the worksheet and survey information the estimated economic loss per cow due to reproductive problems at 91 days open was approximately $24.02. Dividing this loss by one (days open beyond 90 days) as the worksheet does shows the cost per day per cow due to excessive days open was $24.02. The total estimated loss per cow at 92 days open was approximately $25.25; however, dividing this by two shows the loss per day per cow was

$12.63, about one-half the loss per day per cow at 91 days open. The reason for this is the divisor at 92 days open is twice that at 91 days open, yet the difference between the dividends is only $1.23. This mathematical problem causes the tremendous curve shown in Figure 1 which decreases at a decreasing rate as days open increase.

The worksheet (Appendix B) from Grusenmeyer et al. (8) has other problems also. It is a straight forward approach and does not consider more complicated economic aspects such as the time value of money and marginalism. However, the worksheet is used throughout the Western United States and may be the only worksheet of this type which dairymen can use to estimate economic losses in their herds due to reproductive problems. Considering the problems in the design of the worksheet it should be used only as an estimate of economic losses due to poor levels of reproduction rather than excessive days open.

Because the worksheet from Grusenmeyer et al. (8) contains problems concerning the economic losses caused by excessive days open, an attempt was made in this study to separate the actual loss due to days open from losses due to other reproductive problems of surveyed dairymen. The total cost per cow in herd shown in Table 9 was used as an estimate of the total reproductive loss survey dairymen were suffering for different numbers of days open. When this loss was compared for different numbers of days open it was found in this study that survey dairymen were actually losing an average \$1.22 per cow per day due to excessive days open. In addition, they were losing an average \$22.87 per cow due to inferior reproduction levels and veterinary costs associated with reproductive problems. Table 10 shows how these losses were derived using the total estimated cost per cow in herd shown in Table 9.

Surveyed dairymen were losing an average \$39.53 per cow in their herd due to excessive days open. Assuming r is a good indicator of the effect missed heats have on days open, up to \$32.42 of this loss was due to missed heats (r^2 =.82). Extra services per conception accounted for about \$5.14 of the loss (r^2 =.13). Assuming the surveyed herds are a representative sample, the average Utah and Southeastern Idaho herd of 100 cows loses approximately \$3950 per year due to excessive days open. Missed heats may account for approximately \$3240 or up to 82 percent of this loss. Extra services per conception account for about \$510 or 13 percent of the loss. However, as previously indicated as much as ten percent of anestrus may be due to physiological problems rather than failure to observe estrus. If physiological problems exist the amount lost due to missed heats should be adjusted to about \$2920 for the average 100 cow herd in Utah and Southeastern Idaho.

The major factor which contributes to excessive days open is missed heats. Utah and Southeastern Idaho dairymen

Table 10. Example of how the $1.22 per cow per day due to days open and the average $22.87 per cow due to inferior reproduction levels and veterinary costs associated with reproductive problems other than excessive days open were derived using the total costs per cow shown in Table 9 (column 3). The total estimated cost per cow in herd (TC) from Table 9 has a $12.23 difference in total cost (DC) for every 10 days difference in days open (DD). $12.23 (DC) divided by 10 (DD) equals $1.223 per cow per day open beyond 90 days (CCD). Subtracting $1.223 (CCD) times the number of days open beyond 90 days from the total cost per cow in herd (TC) from Table 9 shows an average $22.87 per cow was lost due to causes other than excessive days open. This loss was attributed to reproduction levels inferior to the top levels reported possible on an average basis and veterinary costs associated with reproductive problems other than excessive days open.

Total days open (DO)	Difference in days open (DD)	Total estimated cost/cow in herd (TC) from Table 9	Difference in total cost (DC)	Cost/cow per day (CCD) DC÷DD	Loss due to other problems TC-CCD(DO-90)
95		28.98		1.223	22.865
105	10	41.21	12.23	1.223	22.865
115	10	53.44	12.23	1.223	22.865
125	10	65.67	12.23	1.223	22.865
135	10	77.90	12.23	1.223	22.865
145	10	90.13	12.23	1.223	22.865
155	10	102.36	12.23	1.223	22.865
165	10	114.59	12.23	1.223	22.865
175	10	126.82	12.23	1.223	22.865

surveyed are missing an average 1.78 breedable heats per cow in herd with a standard deviation of 1.01 heats. Missed heats ranged from 0.39 to 4.57 breedable heats per cow among herds surveyed. This indicates surveyed dairymen were missing approximately 50 percent of breedable heats in their herds with a range of 18 to 75 percent. Due to anestrus and embryonic loss or abortion these estimates are not exact, but they are the best estimates which can be determined from a survey of this type. Table 11 shows losses resulting from missed heats in dairy herds which were surveyed.

Estimates in Table 11 were derived using 1.75 services per conception as a basis because that was the average number of services survey dairymen used to get cows settled. Adding average heats missed per cow in herd to 1.75 heats (heats needed to get cows bred with 1.75 services per conception) gave the estimated heats needed to get cows bred. Dividing average heats missed per cow in herd by estimated heats needed to get cows bred yielded percent missed heats at 1.75 services per conception. Multiplying average heats missed per cow in herd by 21 days (one heat cycle equals 21 days) gave estimated days open due to missed heats. Estimated days open due to missed heats plus 15.75 days (days open due to 1.75 services per conception) plus 60 days (optimal days to first service for most surveyed dairymen) plus 10.5 days (one-half heat cycle) equals total days open. Total days

Table 11. Percentage of missed heats at average (1.75) services per conception, estimated heats needed to get cows bred, estimated days open due to missed heats, and economic loss per cow in herd relative to average heats missed per cow in herd.

Average heats missed per cow in herd	Missed heats at 1.75 services per conception	Estimated heats needed to get cows bred	Estimated days open due to missed heats	Estimated cost per cow due to missed heats
	(%)			($)
.25	13	2.00	5.25	1.50
.50	22	2.25	10.50	6.75
1.00	36	2.75	21.00	17.26
1.50	46	3.25	31.50	27.76
2.00	53	3.75	42.00	38.27
2.50	59	4.25	52.50	48.77
3.00	63	4.75	63.00	59.27
3.50	67	5.25	73.50	69.78
4.00	70	5.75	84.00	80.28
4.50	72	6.25	94.50	90.79
5.00	74	6.75	105.00	101.29

open minus 90 days equals days open beyond 90 days. Days open beyond 90 days times $1.22 (cost/cow/day beyond 90 days open) times 82 percent ($r^2=.82$ for missed heats and days open) yielded the estimated cost per cow due to missed heats.

As Table 11 illustrates, missed heats are costly. Improving heat detection methods can be very profitable. Grusenmeyer et al. (8) reported the best times to observe cattle for estrus are dawn, noon, and evening. However, dawn and evening yield only a five percent lower detection level than when noon is included. They further reported, observation 24 hours per day will yield the best results, but other detection methods such as KaMar heat detectors, continuous video tape, and chalked tail heads will give good results (8). Obviously, many Utah and Southeastern Idaho dairymen need to improve their heat detection methods.

CONCLUSION

The estimated economic losses due to reproductive problems in Utah and Southeastern Idaho are approximately $62.50 per cow per year. Nearly two-thirds of this loss is due to excessive days open. Extra days open beyond 90 days are costing area dairymen about $1.22 per cow per day. Missed heats account for up to 82 percent of excessive days open while services per conception account for about 13 percent. This strongly indicates that many Utah/Southeastern Idaho dairymen need to implement herd management practices which will increase success of estrus detection. Herds with seriously low efficiency of estrous detection may realize higher net returns from using natural service even though genetic gains are reduced (9).

Average days open is the best indicator of herd reproductive performance and should rarely exceed 110 days (8). Since this is an average, some individual cows will exceed 110 days open. Cows whose days open exceed 110 days need to be checked to determine their reproductive soundness and treated accordingly. Furthermore, dairymen need to establish guidelies for managing these cows. They need to determine profit margins for these cows and know when to cull a cow if she is not rebred. These cows can be culled automatically after reaching a decided number of days open or they can be culled after droppig below an economical level of milk production. This management decision is up to the dairyman, but it must reflect reasoning which will increase and maintain herd profitability.

Many dairymen are accepting poor herd reproductive performance as a standard of the dairy industry and are losing thousands of dollars as a result. If they are having problems with excessive days open dairymen need to evaluate their reproductive management practices and determine what changes they need to make to decrease days open. Dairymen then need to determine the cost of these changes and make sure the changes are profitable. Fortunately, most dairymen, especially those whose herds have extreme days open, should be able to shorten average days open at a very minimal cost. Dairymen who are having problems for which they do not have the answers need to seek advise from veterinarians or extension personnel.

Most Utah/Southeastern Idaho dairymen should save approximately $25.62 per cow in their herd if they reduce average heats missed per cow in herd by 1.0 heat. Grusenmeyer et al. (8) reported dairymen should reduce days open by about 10 days if they do any one of the following: increase heat detection by 10 percent, increase conception rate by 10 percent, or reduce actual days in milk at first breeding by 10 days. Most Utah/Southeastern Idaho dairymen could save approximately

$12.20 per cow in their herd by reducing average days open by 10 days.

The average economic losses in the Utah/Southeastern Idaho area of $1.22 per cow per day due to days open and the $22.83 per cow per year due to reproduction levels inferior to the best levels which can be expected have been estimated from this study. However, these losses are extremely variable among herds. Due to the fact that only DHI herds were surveyed and the data were highly variable, it is recommended the values determined be used only as liberal estimates rather than actual costs. If dairymen want to know the extent of losses on their own farms due to reproductive problems, a more accurate estimate could probably be obtained by using their own data. Using the worksheet from Grusenmeyer et al. (Appendix B) dairymen can estimate their total loss due to reproductive inefficiency. However, dairymen should be aware that problems exist in the worksheet when it is used to determine the cost of excessive days open. Therefore, the worksheet should not be used to estimate this cost. Further research needs to be done to improve heat detection and dairymen need to become more aware of information on heat detection.

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APPENDIXES

Appendix A. Survey Questionnaire

NAME ______________________ DATE __________

ADDRESS ______________________________

CITY ______________ STATE ________ ZIP CODE ________

PHONE NUMBER ______________ COUNTY ______________

Please fill out information requested but be as accurate as possible, don't guess. If you don't know or don't have the information requested enter D/K. If a question is not applicable to your operation enter N/A on line beside number.

GENERAL INFORMATION

Number of heifers and bulls in dairy herd at the end of 1985 in the following groups:

__________ 01 heifers under one year of age

__________ 02 heifers over one year, but haven't calved

__________ 03 bulls under one year of age

__________ 04 bulls over one year of age

Number and average value of newborn calves born in dairy herd during 1985:

Number	Average value/calf	
________	________	05 grade bulls
________	________	06 grade heifers
________	________	07 registered bulls
________	________	08 registered heifers

Milk sales for 1985:

__________ 09 Dollar value of gross milk sales for 1985.

__________ 10 Total pounds of milk sold in 1985.

__________ 11 Percent of milk sold as grade A in 1985.

FEED INFORMATION

Volume of following feedstuffs used for dairy in 1985:

TOTAL VOLUME	% PURCHASED		
______	______	12	Concentrates (tons)
______	______	13	Hay (tons)
______	______	14	Corn silage (tons)
______	______	15	Haylage (tons)
______	______	16	Whole cottonseed (tons)
______	______	17	Pasture (acres)
______	______	18	Supplements (cwt)
______	______	19	Other (Explain) __________

Purchase price of following feedstuffs (**if purchased**) in 1985:

______ 20 Concentrates (price/ton)

______ 21 Hay (price/ton)

______ 22 Corn silage (price/ton)

______ 23 Haylage (price/ton)

______ 24 Whole cottonseed (price/ton)

______ 25 Pasture (cost/acre)

______ 26 Supplements (price/cwt)

______ 27 Other (explain) __________

VETERINARY INFORMATION

______________ 28 Is your herd on a routine herd health program? (Yes or no)

______________ 29 Total veterinary costs for dairy herd for 1985.

______________ 30 Percentage of the above veterinary costs (#28) for dairy herd that were related to reproduction problems.

LABOR INFORMATION

Labor information is only for labor which is used on dairy herd including milking, feeding, and caring for livestock. Exclude labor for farm operations.

______________ 31 Average number of family members working on dairy in 1985.

______________ 32 Average hours per month per family member working on dairy in 1985.

______________ 33 Average number of non-family employees who worked in 1985 on a full-time basis (100 hours or more/month).

______________ 34 Average hours per month worked on dairy per full time non-family employee.

______________ 35 Average salary per month per non-family employee who worked in 1985 on a full-time basis.

______________ 36 Average number of non-family employees who worked in 1985 on a part-time basis (less than 100 hours/month).

______________ 37 Average hours per month worked on dairy per part-time employee.

______________ 38 Average salary per month per non-family employee who worked in 1985 on a part-time basis.

CULLING AND REPLACEMENT INFORMATION

______________ 39 Total number of cull cows sold in 1985.

______________ 40 Number of cows culled in 1985 due to reproductive problems.

Salvage value of cull cows sold in 1985:

______________ 41 Total dollar value of cows sold for dairy purposes.

______________ 42 Total dollar value of cows sold as beef.

______________ 43 Average price per cow sold for dairy purposes.

__________ 44 Average price per cow sold as beef.

__________ 45 Total number of dairy replacements purchased in 1985.

__________ 46 Total number of dairy replacements entering herd in 1985 which were raised.

__________ 47 Average cost per dairy replacement purchased in 1985.

__________ 48 Average cost per dairy replacement which was raised on your dairy and entered the milking herd in 1985.

BREEDING INFORMATION FOR COWS AND HEIFERS

__________ 49 How are cows in your dairy herd bred?
1) AI 2) natural service 3) both

__________ 50 How are heifers in your dairy herd bred?
1) AI 2) natural service 3) both

__________ 51 Percent of calves born to cows in 1985 which were sired by AI bulls.

__________ 52 Percent of calves born to heifers in 1985 which were sired by AI bulls.

__________ 53 Age at first breeding of **grade heifers.**

__________ 54 Age at first breeding of **registered heifers.**

__________ 55 Weight at first breeding of **grade heifers.**

__________ 56 Weight at first breeding of **registered heifers.**

__________ 57 Number of registered cows purposely bred back late in order to complete a 365-day lactation.

__________ 58 Number of units of semen used in 1985.

__________ 59 Total cost of semen used in 1985.

__________ 60 Average cost per unit of semen used in 1985.

Number of mature bulls used in herd breeding program (natural service).

__________ 61 At present time

__________ 62 Total used in 1985

__________ 63 Purchased in 1985

__________ 64 Raised in 1985

Number of cows and heifers bred by natural service to the following breeds of bulls during 1985.

Cows	Heifers		
__________	__________	65	Holstein
__________	__________	66	Jersey
__________	__________	67	Other dairy breed - Specify: __________
__________	__________	68	Beef breed - Specify: __________

Average cost per breeding bull entering herd in 1985:

__________ **69 Purchased**

__________ **70 Raised**

FURTHER INFORMATION

__________ **71 May we use your DHI records for further needed information? (Yes or no)**

__________ **72 May we contact you for further information if needed? (Yes or no)**

__________ **73 Would you be interested in receiving the results of this survey? (Yes or no)**

Appendix B. Worksheet for Deriving the Cost of Excessive Days Open

If the estimated values used in the state average calculations are different from those you feel are correct for your herd, use your estimates and calculate your herd cost of days open below.

DHI Values		Your Estimates	
Average days open	________	Replacement cost	$ ________
________ Days open − 90 = ________ excessive days open			
Blend milk price	________	Cull slaughter value	$ ________
Number of reproductive culls	________	Av. A.I. service cost	$ ________
Total cows in herd	________	Vet and medicine per cow	$ ________
Service per cow	________	Av. value of calves born	$ ________

PRODUCTION

(.1744 x ________ days open) − 17.6606 = ________ cwt's of milk lost

$ _______ blend milk price − $ _______ feed cost per cwt of milk = $ _______ value of potential milk

________ cwt's of milk x $ ________ loss/cow/year

$ ________ loss/cow/year ÷ ________ excessive days open = $ ________ loss/cow/day

ADDED A.I.

________ services per cow − 1.5 = ________ extra services/cow

________ extra services/cow x $ ________ service cost = $ ________ extra cost/cow/year

________ extra cost/cow/year ÷ ________ excessive days open = $ ________ loss/cow/day

VET AND MEDICINE

$ ________ total dollars spent on problem cows ÷ ________ cows in herd = $ ________ annual/loss/cow

$ ________ annual loss per cow ÷ ________ excessive days open = $ ________ loss/cow/day

CALF LOSS

$ ________ av. calf value ÷ 380 = $ ________ calf loss/cow/day

REPLACEMENTS

_______ No. reprod. culls ÷ _______ total cows = _______ = _______ % reprod. culls

__________ % reprod. culls − 5% = __________ % excess reproductive culls

________ % excess reprod. culls = ________ x ________ cows in herd = ________ excess reprod. culls

$ _______ replacement cost − $ _______ cull value = $ _______ replacement-cull difference

________ number excess culls x ________ replacement-cull difference = $ ________ herd loss

$ ________ herd loss ÷ ________ cows in herd = $ ________ loss/cow/year

$ __________ loss/cow/year ÷ __________ excessive days open = __________ loss/cow/day

TOTAL COST OF DAYS OPEN

Value of lost production per cow per day	$________
AI cost per cow per day	$________
Vet and medicine cost per cow per day	$________
Calf loss per cow per day	$________
Replacement cost per cow per day	$________
Total cost per cow per day over 90 days open	$________

From Grusenmeyer et al. (8) page 13

Appendix C. Formulas for Calculating Days Lost Due to Conception Failure and Missed heats.

Days lost due to conception failure equal: (s/c -1) x 21

Days lost due to missed heats equal:

(TDO-VWP-10.5-[(s/c-1)x21]

s/c = Services per conception

TDO = Total days open

VWP = Voluntary waiting period

Adapted from Barr (1)